REMARKS

In view of the following remarks and the foregoing amendments, reconsideration and allowance are respectfully requested.

Claims 1-19 are pending at the time of this action, with Claims 1, 3-6, 12, 16, and 18 being independent. Claims 1-15, 18 and 19 are allowed. Claim 16 has been amended. No other claims are amended in this response.

Claims 16 and 17 stand rejected under 35 U.S.C. 103(a) as allegedly being unpatentable over Hasegawa et al. (US Patent 5,917,620) in view of Antonelli et al (US Patent 6,259,108). This contention is respectfully traversed.

35 U.S.C. 103 - Claims 16, 17, and 19

Amended Claim 16 is patentable over the suggested combination of Antonelli and Hasegawa at least because the suggested combination fails to teach each and every feature of the claim.

As explained in the previous response, Antonelli teaches an optical image apparatus with a contact image sensor (Antonelli: Abstract). Antonelli teaches that the contact image sensor can have a linear array optical sensor and can have light sensing pixels with CCD pixels, CMOS APS pixels, or photo-diode pixels (Antonelli: Abstract). Hasegawa teaches "an image reading apparatus comprising plural line sensors for converting light from an object into image signals" and "charge transfer unit for transferring the image signals" (Hasegawa: Abstract). The image sensor of Hasegawa uses "so called TDI (time delay and integraton)" based on integrating and transferring charges

between CCD sensors and shift registers to output units (Hasegawa: Col. 2, lines 56-67; Col. 3, lines 1-40).

The suggested combination of Hasegawa and Antonelli fail to teach or suggest the amended claims features of:

> coupling a linear integrator array of switched-capacitor integrators to the linear sensing array to sample multiple frames of images of the object generated by the sensing array, wherein for each frame, columns of pixels in the linear sensing array are mapped to respective columns of switched-capacitor integrators in the linear integrator array (emphasis added).

The amendments to the Claim 16 do not add new matter and are supported within the specification. For example, Fig. 1B shows the column-parallel integrator array 120, Figs. 3A, 3B, 4A, 4B, 5A, 5B, 7A, and 7B each show a switched-capacitor integrator, and Fig. 1C shows a table that illustrates the mapping from the sensing array to the integrator array.

The suggested combination of Hasegawa and Antonelli fail to teach or suggest "coupling a linear integrator array of switched-capacitor integrators to the linear sensing array." As described above, Hasegawa uses CCD sensors and shift registers to perform the integration. However, Hasegawa fails to teach using an array of switched-capacitor integrators to perform the integration.

Antonelli suggests using CMOS APS pixels for sensing. However, Antonelli fails to teach or suggest (1) subsequent integration and (2) coupling to an array of switch-capacitor

integrators. Therefore, Antonelli fails to remedy the deficiencies of Hasegawa.

Therefore, Claim 16 is distinctly patentable over the suggested combination of Antonelli and Hasegawa at least because the suggest combination fails to teach or suggest each and every feature of the claim.

Amended Claim 16 is further patentable over Hasegawa and Antonelli at least because the cited references would render the invention unsuitable for its intended purpose. The current office action alleges that the proposed combination of Hasegawa and Antonelli renders Claim 16 obvious because the APS (active pixel sensing) pixels of Antonelli can replace the CCD sensor of Hasegawa (office action: page 2). However, the proposed modification would render the prior art invention being modified unsatisfactory for its intended purpose. If proposed modification would render the prior art invention being modified unsatisfactory for its intended purpose, then there is no suggestion or motivation to make the proposed modification (MPEP 2143).

For example, Claim 16 recites "internally converting radiation-induced charge in each pixel of the linear sensing array into a voltage representing an electrical pixel signal" (emphasis added). Therefore, Claim 16 recites that the captured radiation in each pixel is internally converted into a voltage within the linear sensing array itself. However, Hasegawa teaches that the electrical pixel signal is not converted into a voltage until after the signal exits the CCD linear image sensor 1300 and enters the Analog Signal Processing Unit 101 (Hasegawa:

Fig. 10A, Col. 5, lines 26-34; Col. 8, lines 2-10; Col. 9, lines 33-44). Hence, Hasegawa teaches that the conversion from charge to voltage occurs after integration occurs, whereas Claim 16 recites that the electrical pixel signal is converted into a voltage while the electrical pixel signal is still within the linear sensing array itself. Claim 16 is patentable over Hasegawa for this reason alone.

Furthermore, Hasegawa teaches that the CCD linear image sensor performs integration while the electrical pixel signal is still in the form of charge and not in the form of voltage (Hasegawa: Col. 6, lines 23-35). Since Hasegawa performs integration while the electrical pixel signal is still in the form of charge, Hasegawa would have no need or use for a separate array of switched-capacitor integrators to perform the same type of integration. Therefore, Hasegawa fails to teach or suggest all of the features of Claim 16 at least because Hasegawa teaches charge integration and not integration using a switched-capacitor integrator.

Antonelli does not remedy the deficiencies of Hasegawa at least because the suggested combination of Antonelli and Hasegawa could not integrate charge within the linear image sensor if CMOS APS pixels were used instead of CCD cells for the linear image sensor. CMOS APS pixels would be needed to convert the charge into voltage within the linear image sensor itself. However, Using CMOS APS pixels would render the suggested combination unsuitable for its intended purpose. The suggested combination of Hasegawa and Antonelli could only perform charge integration, according to the teachings of Hasegawa, and not the integration as recited in Claim 16 using switched-capacitor

integrators. Also, the charge could not be shifted along the various charge shift registers between the CCD cell arrays if the charge had already been converted into a voltage (Hasegawa: Figs. 8, 9A, 9B). Furthermore, the charge integration technique as taught in Hasegawa has disadvantages when compared to the integration technique of Claim 16 and the instant disclosure, such as image smearing and a reduced signal-to-noise ratio (instant disclosure: page 6, lines 2-23; page 13, lines 1-2). Therefore, Hasegawa and Antonelli cannot be combined to both perform charge integration as taught by Hasegawa and convert the charge to voltage within the linear image sensor itself.

At least for the reasons described above, Claim 16 is patentable over the suggested combination of Hasegawa and Antonelli.

Claim 17 is patentable at least for depending upon an allowable base claim (base Claim 16). Allowance of Claims 16 and 17 is requested.

Attorney's Docket No.: 06618-526001/CIT3088

Conclusion

In view of the amendments and remarks herein, the Applicants believe that Claims 1-19 are in condition for allowance and ask that these pending claims be allowed. The foregoing comments made with respect to the positions taken by the Examiner are not to be construed as acquiescence with other positions of the Examiner that have not been explicitly contested. Accordingly, the arguments for patentability of a claim should not be construed as implying that there are not other valid reasons for patentability of that claim or other claims.

Applicant asks that all claims be allowed. No fee is believed to be due at this time. Please apply any other charges or credits to Deposit Account No. 06-1050.

Respectfully submitted,

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Date: April 10, 2006

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